COMPLETION REPORT
INTERIM REMEDIAL ACTION
GROUNDHOG MINE STOCKPILE
HANOVER AND WHITEWATER CREEKS INVESTIGATION UNIT

May 14, 2009
073-92553-03

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Submitted to:

Freeport McMoRan Chino Mines Company
210 Cortez Avenue
Hurley, New Mexico 88043

Submitted by:

Golder Associates

301 West College Avenue, Suite 8
Silver City, New Mexico 88061

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1.0 INTRODUCTION

This completion report summarizes the reclamation of the Groundhog Mine Site within the Hanover and Whitewater Creeks Investigation Unit (HWCIU) under an Interim Remedial Action (IRA) pursuant to the Administrative Order on Consent (AOC) for Freeport McMoRan Chino Mines Company (Chino). This work was performed in accordance with the IRA Work Plan (Chino, 2003).

The Groundhog Mine Site location is shown on Figure 1. Originally, there were five stockpiles at the Groundhog Mine Site (Figure 2), identified as G1 through G5 in the IRA Groundhog Mine Site Investigation Report (SIR; Golder Associates Inc. [Golder], 2001).

Chino removed stockpile material and hauled it to the West Stockpile near the Santa Rita Pit. The New Mexico Environment Department (NMED) allowed Chino to relocate the Groundhog stockpiles to the Chino West Stockpile, consistent with the terms of Chino Discharge Plan 526 (DP-526). Material was removed to bedrock at all stockpile locations.

Following stockpile removal, the excavated surface was characterized according to the Work Plan (Chino, 2003). The site was then reclaimed with a vegetated soil cover, shafts associated with the Groundhog Mine were closed, and stormwater control was established. This report describes the removal and reclamation activities, and provides results of the post-removal sampling. A post-removal monitoring plan is also proposed for monitoring for potential erosion, vegetation, and water quality.

This completion report is organized into the following sections. Section 2 states the purposes of the IRA and Section 3 contains the site description and a brief history. Section 4 describes the removal and reclamation activities and Section 5 recounts the monitoring activities during the removal period. Section 6 presents a post-reclamation monitoring plan for the site. A summary is presented in Section 7 and Section 8 contains references.

2.0 STATEMENT OF PURPOSE

This section discusses the objectives and scope of work of the IRA for the Groundhog Mine site. Stockpile removal at the site and surface reclamation met the objectives of the IRA and were consistent with the long-term objectives of the AOC.

2.1 Interim Action Objectives and Long-Term Strategies

The primary objective of the IRA was to reduce mass-loading of metals and acidity from source materials to groundwater and surface water in accordance with New Mexico Water Quality Control Commission (WQCC) requirements under Regulation 1203. Removal of the Groundhog stockpile material effectively reduced mass-loading from source materials and controls potentially poor-quality surface water discharges and groundwater seepage resulting from past mining activities at the site.

The remedial action implemented at the Groundhog Mine is consistent with the following long-term remedial objectives:

- Preventing future releases to surface water, groundwater, and soil or sediment;
- Limiting direct exposure to waste materials;
- Achieving post-mining land use; preventing erosion; and
- Ensuring physical stability and site safety.

This interim action is also consistent with the long-term strategy for closure/closeout and meets standards prescribed in the AOC agreement. Requirements under the New Mexico Mining Act and rules primarily pertain to returning the disturbed area to a post-mining beneficial use, such as wildlife habitat or grazing. Once vegetation matures on cover material and erosion is stabilized, the area will become a self-sustaining ecosystem for wildlife habitat and/or grazing.

2.2 Interim Remedial Action Scope of Work

The IRA was conducted in three phases. The first phase included a site investigation as described in the SIR (Golder, 2001), and a seepage collection system was constructed as a temporary measure to collect shallow groundwater. The second phase involved the development of the IRA Work Plan for removing the stockpiles (Chino, 2003). The third phase of the remedial action involved the excavation of the stockpiles based on the Work Plan.

3.0 BACKROUND AND HISTORY

The Groundhog Mine Site is approximately 1-1/2 miles northeast of Bayard, New Mexico. The site lies within a small canyon that drains into Whitewater Creek. The following sections describe the general hydrogeologic characteristics and historical operations of the site, and some of the actions taken before the IRA.

3.1 Site Characteristics

The Groundhog Mine Site is located in the valley of a north-flowing unnamed tributary to Whitewater Creek, and in Bayard Canyon. Prior to removal activities, stockpile material was underlain by unconsolidated alluvium and colluvium up to 10 feet thick. Bedrock at the site is the Kneeling Nun Tuff, Sugarlump Tuff, quartz monzonite, and grandiorite. The main structural feature in the area is the Groundhog Fault, which strikes northeast and dips to the east. The fault occurs along the eastern edge of the site.

Prior to removal of stockpile materials and alluvium/colluvium at the site, water infiltrated from the surface into the stockpile materials and alluvium during storms and snow melt. Due to the naturally low permeability of the bedrock, infiltrating water perched on the bedrock contact and flowed laterally, down gradient along the contact in the direction of the natural surface drainage (Golder, 2001).

A deeper groundwater system underlies the bedrock at the site. Based on measurements from three monitoring wells in the vicinity of the site and an evaluation of site topography, depth groundwater ranges from 25 to 100 feet below ground surface (Golder, 1999). Groundwater flow between bedrock and the alluvium/colluvium is limited by the marked contrast in permeability between the two units; the bedrock is estimated to be 3 to 5 orders of magnitude less permeable than the alluvuim (Golder, 1999). Based on the magnitude of this contrast, seepage downward from the alluvium/colluvium is minor compared to flow along the bedrock surface.

Mining-related materials at the Groundhog Mine are described in detail in the SIR (Golder, 2001). The investigation delineated the following areas (Figure 2):

- Stockpile G1
- Stockpile G2
- Stockpile G3 East

- Stockpile G3 West
- Stockpile G4
- Stockpile G5
- Valley Fill
- Foundations
- Paved Roadbed

The site removal activities included all of the areas listed above. The lateral and vertical extents of potentially acid-generating materials was defined in the SIR (Golder, 2001). The SIR estimated the total volume of mine and mine-impacted materials at the site to be approximately 210,000 cubic yards.

3.2 Historical Operations

Underground mining began at the Groundhog Mine site as early as 1869 (Lasky, 1936), and continued until approximately 1978, producing primarily lead and zinc. The Groundhog vein is located along the eastern edge of the valley, striking generally northeast. Prior to mining, the vein surfaced for approximately ½ mile and extended towards the southwest for another 3,000 feet or more along the east side of Bayard Canyon, where it was covered by Tertiary sedimentary rocks. Near the San Jose Shaft, the vein outcrop formed a “prominent wall of jaspery quartz” (Lasky, 1936).

The Groundhog site was owned by a number of companies over the years; the last operator was ASARCO. Before transferring the property to Chino in 1994, ASARCO relocated several stockpiles associated with the Groundhog Mine from Bayard Canyon to the unnamed tributary and covered them with several inches of cover soil from nearby hillsides.

3.3 Preliminary Interim Remedial Action Activities

In early 1997, Chino published the Health and Safety Plan, which was in effect for all the investigations conducted under the AOC (Chino et al, 1997). Also in 1997, Daniel B. Stephens & Associates (DBSA) conducted the Phase I Investigation, which included the Groundhog Mine Site (DBSA, 1997). Golder further investigated the area in 1999 and reported the findings in the Comprehensive Groundwater Characterization Study (Golder, 1999). Golder also produced the Site Investigation Report (2001) for the Groundhog Mine Stockpile of the HWCIU.

Chino initiated the following temporary measures preceding the IRA at the Groundhog Mine site:

- The unnamed tributary has a drainage area of approximately 100 acres. Chino constructed a temporary concrete cutoff wall that tied into bedrock downgradient of the stockpiles, with the exception of G4, in 1996. The cutoff wall was constructed with a gravity drain to a collection sump in Whitewater Creek. Diversion ditches were also excavated that same year to divert much of the upgradient surface-water run on around the site.

- In August 1999, during a season of heavy rains, groundwater seeps were observed upgradient of the cutoff wall. The gravity drain was then replaced with a pump and connected to a process water line to Reservoir 16.

- In June 2000, Chino installed a drain field upgradient of the cutoff wall and extended the capture area of the cutoff wall with a subsurface high-density polyethylene (HDPE) hydraulic barrier across a buried portion of the drainage. The drain field was also covered with an HDPE liner that captured seepage from the stockpiles, while allowing unaffected surface water to run off into Whitewater Creek.

- This sump has been used for stormwater collection on two occasions. A historical tin can plant was discovered beneath a culvert downgradient of the original concrete cutoff wall. This sump was installed to collect stormwater runoff from the removed tin can plant operation. The collected stormwater was then pumped to the Reservoir 17. The sump was later used to collect stormwater runoff during the construction phase of the current headwall following stockpile removal. Now that these earth work activities have been completed, the sump is generally dry. The sump may be pumped if stormwater were to flow over the headwall in response to a high magnitude storm event. However, water has not overtopped the headwall even during the 100-year rain events of the summer of 2008.

- Early in 2003, the subsurface HDPE hydraulic barrier was replaced with a concrete wall keyed to the original cutoff wall. Due to its position, downgradient of the seepage collection system, Stockpile G4 was removed in February 2003, and placed on the Chino West Stockpile. Later in 2003, Chino published the AOC IRA Work Plan for the Groundhog Mine Site, which guided the work described in this completion report.

4.0 STOCKPILE REMOVAL

The scope of work for the IRA for the Groundhog Mine Site included removing all potentially acidic stockpile material, affected soil and bedrock, roadbed, and foundation materials delineated in the SIR (Golder, 2001). This section discusses the activities associated with stockpile removal and reclamation. Figures 3 through 12 are photographs of the removal and reclamation activities.

4.1 Pre-Excavation Preparation

Prior to excavation of material from the Groundhog site, existing utilities were located and marked by Blue Stake, and surveyed for addition to Chino's base map for future reference. Historical mine opening locations were also surveyed as part of the Blue Stake process.

Stormwater run on diversion channels had already been excavated upgradient of the stockpiles (Section 2.3). The existing seepage collection system was excavated, creating a basin behind the cutoff wall to contain stormwater runoff and act as a settling basin during excavation. Pumps removed the collected stormwater and transported it to Reservoir 17, consistent with the National Pollutant Discharge Elimination System (NPDES) requirements for construction sites.

4.2 Stockpile Excavation

Chino excavated materials from December 2003 until completion in November 2005. Excavation occurred intermittently due to the need for infrastructure relocation (Section 4.3). Using front-end loaders and track hoes, impacted materials were excavated to bedrock, where possible, given the limitations of terrain and equipment. Bedrock was then scraped to remove weathered surfaces. The stockpile material, which was left in place along the existing pipeline corridor and in the immediate vicinity of the telemetry station (Figure 13), will be addressed during closure under DP-1340.

The excavated material was transported to the West Stockpile using haul trucks. Approximately 270,000 tons of material were actually excavated during removal. This excludes the G4 Stockpile, which had already been removed prior to submittal of the IRA Work Plan. Excavated material was placed on the eastern side of the West Stockpile, within a permitted area for leaching under DP-526.

4.3 Infrastructure Relocation

Chino relocated infrastructure at the site intermittently during excavation activities. Power lines were de-energized as needed and poles removed for the duration of localized excavation activities. The existing pipeline corridor and telemetry station (Figure 2) remain operational and will be addressed under closure.

4.4 Shaft Closure

Exposed mine openings at the Groundhog Mine were closed as required by the IRA Work Plan (Chino, 2003). Four shafts were identified in the IRA Work Plan, including the San Jose Shaft, the Groundhog North Shaft, the Groundhog No. 1 Shaft, and the Homestake Shaft. An additional glory hole was also identified near the San Jose Shaft. During removal activities, only the San Jose Shaft and San Jose Glory Hole were encountered, as well as a sinkhole near the San Jose Shaft that was likely a caved-in former stope to the San Jose Shaft.

The San Jose Shaft and associated sinkhole were closed using a toroid plug covered with a cabled tire mat and a mounded soil cover graded to drain surface water off the areas. Chino determined that the San Jose Glory Hole was adequately plugged with fill and debris and did not pose a safety hazard. Minor regrading was completed around the plugged opening to enhance stormwater runoff. St. Cloud Mining Company (St. Cloud) installed the toroid plugs and Golder observed the construction. Details of the shaft closure are in Appendix A.

4.5 Reclamation

Mine reclamation objectives require minimizing erosion associated with overland runoff and concentrated flows from high precipitation storm events. The overall goal was to provide a stable surface that enhances vegetation growth and allows the establishment of a self-sustaining eco-system. The completed project also protects surface water and groundwater and supports surface stabilization. A soil cover was placed on excavated surfaces that were not in use as stormwater collection ponds or roads. The soil cover was re-vegetated and surface-water controls established. Ultimately, revegetation of the site will reduce erosion and enhance the post-mining uses.

4.5.1 Cover Placement

After excavation, a 1-foot-thick layer of soil was placed over the remaining bedrock as a growth medium for vegetation. Cover soil was excavated from a local borrow area on the west side of the valley (Figure 13). The loose cover soil was scarified after placement to enhance seed germination. The cover soil was excavated from the borrow area and placed on the post-removal surfaces by St. Cloud. Construction oversight was provided by Telesto Solutions, Inc. (Telesto). Details of the construction activities are included in Appendix B. Figure 13 shows the borrow area and cover placement area. The area shown in Figure 13 as "collapsed mine workings" was covered during shaft closure (Appendix A) by St. Cloud with engineering oversight by Golder.

4.5.2 Revegetation

Native seeds and mulch were spread on the soil cover and borrow area (Figure 13) with a hydroseeder by Freeport McMoRan Reclamation Services, who routinely perform this task for current closure sites in New Mexico and Arizona. Seeds were spread at the application rate specified in the IRA. The seed mixture and application rates are listed in Table 1. The native vegetation will provide forage, seeds, and cover for reptiles, small mammals, and birds common to the area, which will also benefit from the increased insect populations that are likely to accompany vegetation growth. The shrubs, grasses, and forbs will provide forage and browse for larger native animals such as deer and javelina. Functions and attributes of the primary plant species are listed in Table 2.

4.5.3 Surface-Water Controls

Stormwater controls implemented during stockpile excavation and soil cover placement include maintenance of the east and west diversion ditches (Figure 14), containment of all stormwater runoff in two stormwater ponds, and erosion control measures such as hay bales, berms, and swales. The east and west diversion ditches were constructed prior to removal activities to divert unimpacted water around the Groundhog Mine Site. The east diversion ditch was constructed by Chino in 1996 prior to site characterization (Golder, 2001). The west diversion ditch was installed by Chino in 2002. Diversion ditches are designed to convey the 25-year, 24-hour storm event in accordance with the approved IRA Work Plan (Chino, 2003).

After the excavation was completed, drainage swales were established and riprap was installed by St. Cloud, with oversight by Telesto. Riprap was installed along the channel banks where runoff is routed through the site to control erosion of the soil cover by channel flow.

Currently, all stormwater runoff from the site is contained in the two stormwater ponds. Stormwater is pumped to Reservoir 17 via pumps and pipelines installed in each pond. The upper stormwater pond will be pumped dry after rainfall events to minimize the potential for seepage through the stockpile-supported pipeline corridor. Chino will continue to pump the upper stormwater pond until remedial action criteria established in the Record of Decision (ROD; Section 6.0) have been met. When water quality improves in the upper stormwater pond, water may be pumped to a location downstream of the haul road for discharge offsite until cessation of operations when the haul road material and old pipeline corridor material will be removed.

5.0 CONSTRUCTION PERIOD MONITORING

The engineering oversight and environmental monitoring performed during removal and reclamation activities are described in this section. The long-term monitoring plan is presented in Section 6.0.

5.1 Air Monitoring

Dust suppression was conducted during excavation activities by wetting roads and operation sites, and the few occasions when visible dust was observed on an active stockpile removal site. Dust suppression was not necessary except for haul truck activities, as the stockpile materials were usually moist. Because the dust was easily controlled, Chino determined that air monitors were not needed.

5.2 Seepage Monitoring

Seepage monitoring consisted of daily inspections below the cutoff wall during field activities. To collect any potential seepage from beneath or around the cutoff wall, a sump was excavated downgradient and a pump was installed.

5.3 Engineering Oversight

The scope of the engineering oversight included supervising the excavation/reclamation process to make sure that the interim remedial action and post-removal sampling meet the guidelines of the Work Plan (Chino, 2003).

5.3.1 Oversight of Removal and Reclamation Activities

Chino provided oversight of relocation or removal of infrastructure, excavation activities, and control of surface water during excavation activities, including constructing the west diversion ditch.

Oversight of borrow area preparation and excavation, and soil cover placement was provided by Telesto (Appendix B) except for the shaft closure area. Oversight for shaft closure and soil cover installation in the shaft area was provided by Golder (Appendix A).

5.3.2 Post-Removal Sampling

The purpose of post-removal sampling was to document the geochemical nature and distribution of the remaining bedrock surface. Intrusive veins and dikes at the site are naturally mineralized. Understanding the chemical nature of the bedrock provides insight into changes and trends in the quality of shallow seepage as the system stabilizes. After excavation of stockpile materials, the geology of the bedrock surface was mapped by a Chino field geologist. Bedrock geology is shown on Figure 14. Geologic units encountered during field mapping include:

- **Kneeling Nun and Sugarlump Tuff (Tkn)** – These units are not differentiated on Figure 14, but are both included as Kneeling Nun Tuff. This unit occurred along the slopes above the valley.
- **Tertiary Quartz Monzonite (Tqm) –** This unit is a post-mineralization dike occurring near the lower stormwater pond and in the center of the valley on the southern portion of the site.
- **Tertiary Granodiorite (Tgr)** – This unit is differentiated on Figure 14 as either biotized or phyllically altered. Phyllically altered granodiorite occurred only in areas proximal to mineralized veins and mine shafts. The majority of the site was mapped as biotized granodiorite.
- **Jasperoid Vein** – This unit is a mineralized and altered vein within the phyllically altered granodiorite. This vein is hard and resistant to weathering.

Stratified sampling was performed by Golder, with each strata being a visually identified surficial geologic unit within each of three areas (Figure 14):

- **GU Area -** Upper Groundhog area draining to the upper stormwater pond,
- **GL Area -** Lower Groundhog area draining to the lower stormwater pond, and
- **G4 Area** – Former Stockpile G-4.

Golder sampled each material that might differ in its chemical composition and was present in sufficient surface area to influence the overall geochemical behavior of the area. Sample locations are shown on Figure 14. Golder described the general texture of each sample and photographed each location. Sample logs, including photographs and geologic descriptions, are in Attachment C.1 of Appendix C.

Post-removal sample analyses included X-Ray Fluorescence (XRF) analysis of selected metals, total metals analysis, acid-base accounting (ABA), and Synthetic Precipitation Leachate Procedure (SPLP).

Fifty-five grab samples were collected and subjected to XRF analysis and paste pH testing. Results of the XRF analysis and paste pH for the GU, GL, and G4 Areas are compiled in Tables 3, 4, and 5, respectively. The results for the GU and GL Areas are presented with summary statistics for each geologic unit. For the G4 Area, there was only one sample per geologic unit, so summary statistics were inapplicable.

Based on the results of the XRF analysis and paste pH, the samples were composited per each geologic unit in GU and GL Areas. None of the four samples collected in the G4 Area were composited, as each represented a different geologic unit. The sample composite summary is listed in Table 6.

Box and whisker plots were used to qualitatively determine whether the XRF data for each geologic unit represent different distributions (Appendix C). Box and whisker plots are graphical representations of the XRF dataset for each geologic unit in the GU and GL Areas. The plots illustrate that the metal concentrations and paste pH were distinctly different between units. Iron concentrations and paste pH showed the greatest distinction between units (Figures 15 and 16).

Twelve composite samples were subjected to laboratory analysis of total metals, ABA, and SPLP (Tables 7 through 9). All of the five samples with low paste pH and classified as likely to generate acid were collected in the GU Area east of the Haul Road. Sample GU-TRG-G5, composited from grab samples collected west of the Haul Road, was classified as having a low potential to generate acid and had a paste pH of 7.28. All samples collected from the GL and G4 Areas were classified non-acid generating.

Note that for all samples classified as potentially acid generating due to natural mineralization or oxidation by the former stockpile cover, the sulfide sulfur content was low (less than 0.3 percent). In fact, for samples GU-JV, GU-TGRP, and GU-TKN, the sulfide sulfur content was so low that acid generation through oxidation is unlikely. The low values for paste pH likely reflect past reactivity, which may have resulted in formation of oxidation products, such as jarosites, which contain stored acidity that is released when they dissolve. The only samples considered to be potentially acid generating due to future sulfide oxidation were GU-TGR and GU-TQM (Table 7) collected in the GU area. While these samples have a relatively low AGP, they are classified as likely to generate acid due to their lack of neutralizing capacity.

Total metals analysis was conducted to determine the nature of the excavated bedrock surface prior to cover material placement. SPLP testing was performed to determine whether metal concentrations identified by total metals analysis have the potential to leach from the stockpiles.

Generally, samples collected from the GU Area east of the Haul Road had higher metal concentrations and leached elevated concentrations of cadmium, copper, manganese, lead, and zinc. This was expected due to the presence of the mineralized jasperoid vein and phyllically altered granodiorite associated with the ore body. That is, the elevated concentrations are likely naturally occurring background.

The GL and G4 Areas were mineralized to a lesser degree than the GU Area. In samples collected from the GL Area west of the Haul Road, leachate did not contain elevated concentrations of metals or other constituents (Table 9). In samples collected from the G4 Area, leachate did not contain elevated concentrations of metals or other constituents, but did have pH of 8.9 or greater (Table 9).

6.0 POST-RECLAMATION MONITORING

This section presents the post-reclamation monitoring plan for the Groundhog Mine Site. The plan includes monitoring water quality and the vegetation on the soil covers. Following cessation of operations, vegetation and erosion will be monitored until a viable self-sustaining vegetated cover is established for grazing or wildlife habitat post mining land use. The Groundhog site will remain under the oversight of the Chino AOC at least until the Record of Decision for the Hanover and Whitewater Creeks Investigation Unit has been approved by NMED. Monitoring may then be included as part of the long-term closeout actions for Chino under DP-1340.

6.1 Water-Quality Monitoring

Surface water will be sampled semiannually from three locations. Surface water from the upper and lower stormwater ponds will be sampled semiannually if water is present. Samples will also be collected semiannually from the lower stormwater sump (which is a standpipe in the pond footprint) if water is present. Water sampling will be conducted in September and March, altering from the Corrective Action letters dated December 3, 2004 and May 3, 2005, to coincide with NMED Surface Water Quality Bureau collection protocol. This effort tries to collect late winter/early spring runoff and summer monsoon flows. Results will be submitted in the Groundhog Annual Monitoring Report, due at the end of October.

While some variability in the data over time is expected due to seasonal effects and the amount of precipitation prior to the sampling event, the concentrations are expected to reach consistent levels as vegetation stabilizes the soil cover and disturbed bedrock surfaces are exposed to rainfall and runoff. Evidence of decreasing metals concentrations and increasing pH was shown by the data collected during installation of the soil cover (Figures 17 through 22), and these trends are expected to continue now that the interim closure is complete. Once stabilization is indicated by semiannual sampling data, sampling frequency may increase to quarterly to establish that remedial action criteria established in the ROD have been met.

Groundwater is currently being monitored from two monitoring wells (GH-20042S and GH-2004-2D) located upgradient of the headwall (Figure 13) as required by the NMED as part of a corrective action described in a letter dated December 3, 2004. Water quality in the location of the wells will be monitored semiannually to track changes resulting from removal of the stockpile material. Results of surface and groundwater monitoring will be reported to NMED annually.

Once surface-water quality meets remedial action criteria established in the ROD, the cutoff wall may be removed, allowing Groundhog Mine Site stormwater to flow through the unnamed tributary and then into Whitewater Creek. The monitoring wells may then be incorporated into DP-526. This monitoring plan will replace the current plan under the NMED corrective action.

Under the corrective action plan for the site, Chino began semi-annual monitoring and reporting for the lower stormwater sump and pond and the two monitoring wells in October 2004. Analytical data for samples collected from the lower stormwater sump for the corrective action plan are presented in Table 10. These data represent construction-phase monitoring, as the soil cover was not in place until July 2008. Since removal of the stockpiles, metal concentrations have decreased and the pH has increased, showing some water-quality improvement. Figures 17 through 22 show concentrations over time in samples from the lower stormwater sump for cadmium, copper, manganese, lead, zinc, and pH. Water quality is expected to continue to improve as the soil cover becomes stabilized by vegetation. When water meets the criteria necessary to be discharged off site, the site will be included in the site-wide Storm Water Pollution Prevention Plan (SWPPP), pursuant to the Environmental Protection Agency's NPDES, Multi-Sector General Permit program.

Chino proposes to monitor the surface water and groundwater for the following suite of analytes: cadmium, calcium, cobalt, copper, fluoride, iron, magnesium, manganese, nickel, lead, zinc, pH, total dissolved solids, and sulfate. These analytes have been detected in samples from the lower stormwater sump during semiannual monitoring (Table 10) and were detected in SPLP leachate from samples of the stockpile material during the initial site investigation (Golder, 2001). This list of analytes also includes the metals detected in elevated concentrations in the bedrock surface samples discussed in Section 5.3.2.

6.2 Erosion and Vegetation Monitoring

The reclaimed areas will be monitored as follows: The revegetated soil cover and surface-water controls will be inspected, and repaired if necessary, quarterly for 1 year to determine the initial success of the seeding. The surface will be visually monitored for erosion while vegetation physically stabilizes the surface. The primary performance objective for vegetation on the reclaimed area is to stabilize the soils to reduce the rate of erosion. Seeded species are represented on the site based on preliminary inspections. As per DP-1340, Condition 58, a qualitative assessment of the vegetation will be made in the third year after seeding to determine if reseeding or inter-seeding is required. A quantitative evaluation of the vegetation will be made 6 years after seeding to determine if the vegetation is on a favorable trend with respect to Chino's vegetation success criteria. Quantitative final success monitoring will be performed in 2 consecutive years starting no sooner than 11 years after seeding. Results of the vegetation surveys will be submitted as part of annual monitoring reports in the years that the monitoring is conducted.

Surface-water controls and erosion will be monitored quarterly until surface-water quality allows discharge of water offsite. When surface water can be discharged off site, erosion inspections will be included in the inspection of Best Management Practices under the site-wide SWPPP.

7.0 SUMMARY

The remedial action selected for the Groundhog Mine Site IRA was stockpile removal, reclamation with a vegetated soil cover, and surface-water controls. The IRA was conducted in accordance with the NMED-approved Work Plan (Chino, 2003) from December 2003 to August 2008.

Stockpile material was excavated, removed, and placed on the West Stockpile near the Santa Rita Pit. Chino was permitted to relocate the Groundhog stockpiles to the West Stockpile under the terms of Chino's DP-526. Material was excavated to bedrock at all stockpile locations.

Following stockpile removal, the excavated surface was characterized according to the Work Plan. The site was then reclaimed with a vegetated soil cover, shafts associated with the Groundhog mine were closed, and stormwater control was established.

Results of characterization of the bedrock surface indicate that elevated concentrations of some metals occur naturally; however, some residual acidity and metal concentrations may be present as leachate from the stockpile material prior to removal. Water at the site will be sampled as described in Section 6 to monitor improvements to water quality with time. Surface water will continue to be contained on-site and pumped to Reservoir 17 until samples meet remedial action criteria as established in the ROD.

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